



A Builder's Guide To Reducing Mold Risk

ASHRAE Summer Meeting
Quebec City, June 2006



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www.MasonGrant.com



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1 of 23

Project Background

- **California Energy Commission**
 - Nancy Jenkins - Manager of Energy Efficiency Research
 - Ann Peterson - PIER Buildings Program Manager
- **Motivation: Ensure that energy-saving measures do not grow mold in houses**
- **Result: No-cost Builder's Guide as PDF at:**
 - www.gastechnology.org/moldresearch



Project Team



- **Gas Technology Institute - Neil Leslie**
 - Lew Harriman - Mason-Grant
 - Doug Beaman, Beaman Associates
 - Carl Bergstrom, Magus Consulting
 - Charles Eley, Architectural Energy
 - Doug Kosar, Univ of Illinois, Chicago
 - Bud Offerman, Indoor Environmental Engineering
- **Builders**
 - Clarum Homes
 - John Lang Homes - Inland Division
- **Project advisory group (19 organizations)**
- **Donors of material and expertise (34 organizations)**



Project Phases

- 1. Research the moisture/mold-related problems in housing**
 - 1. Insurance records - State of California**
 - 2. Literature research**
 - 3. Expert interviews with participating builders, plus 19 advisors and 34 donors of information/products/services**
- 2. Lab research on problems uncovered**
- 3. Field tests for practicality of possible solutions**
- 4. Test practicality, through seminars for builders**
- 5. Based on the above, produce “Builder’s Guide” to transfer information to users**



Builder's Guide basic approach... risk reduction

- **Building codes allow moldy buildings - no government regulations - it's in our hands**
- **Elimination of all risk is economically and culturally impractical**
- **Least expensive... biggest benefit.. first**
- **Three-part strategy:**
 1. **Keep the water away - reducing the water load**
 2. **Keep the water out - limiting water availability**
 3. **Limit growth until moisture dries out**



Builder's Guide Organization



- **Basic intention: Information delivered:**
 - ... to the decision-maker,
 - ... at the moment of decision
 - ... in a form which is actionable
- **Decision-maker changes over time:**
 - **Developer:** decides the perpetual mold risk
 - **Designer:** decides how to minimize the perpetual risk
 - **Builder:** controls the final mold risk
 - **Owner,** who can increase or reduce risk



**For each decision maker,
information organized into subsections:**

- 1. Keeping water away**
- 2. Keeping water out**
- 3. Limiting mold growth, when things
get wet in spite of best efforts**



Developer controls the SIZE of the water load... the initial mold risk

- **Keeping water away from the building**
 - Site grading, lot coverage and drainage
 - Xeriscape alternative
 - Zero-setback lot lines mean increased risk
- **Keeping water out**
 - Roof line decisions which favor water exclusion
 - Progress payments that favor water-tight connections
 - Below-grade walls carry greater risk



Example: Site grading and hillside construction



- Where does the runoff go?
- Hillsides and cluster housing are denser, therefore riskier
- Plan (and budget) drainage accordingly



Developer's roof line decision... to overhang? or not?



- Even small overhangs **greatly reduce** water load on the walls, therefore reduce risk
- No overhangs = larger water loads = increased risk



Designer will reduce (or increase) the underlying mold risk

- **Keeping water away**
 - Finish grading greatly increases, or reduces water load at the foundation
- **Keeping water out**
 - Minimizing valleys and dormers
 - “Kickout flashing” is essential
 - Vapor barrier in contact with foundation slab, not below sand
 - Two layers of housewrap/building paper behind stucco
 - Sill pan flashing for windows



Designer - Limiting mold growth

- **Breathable interior finish**
- **AC system which dehumidifies**
- **Moisture-tolerant materials in wet areas**
- **Pans under washers and refrigerators**



Designer, increasing and reducing risk



Roof overhangs **reduce** risk

Excellent drainage **reduces** risk

Foundation plantings **increase** risk

Lush irrigation **increases** risk

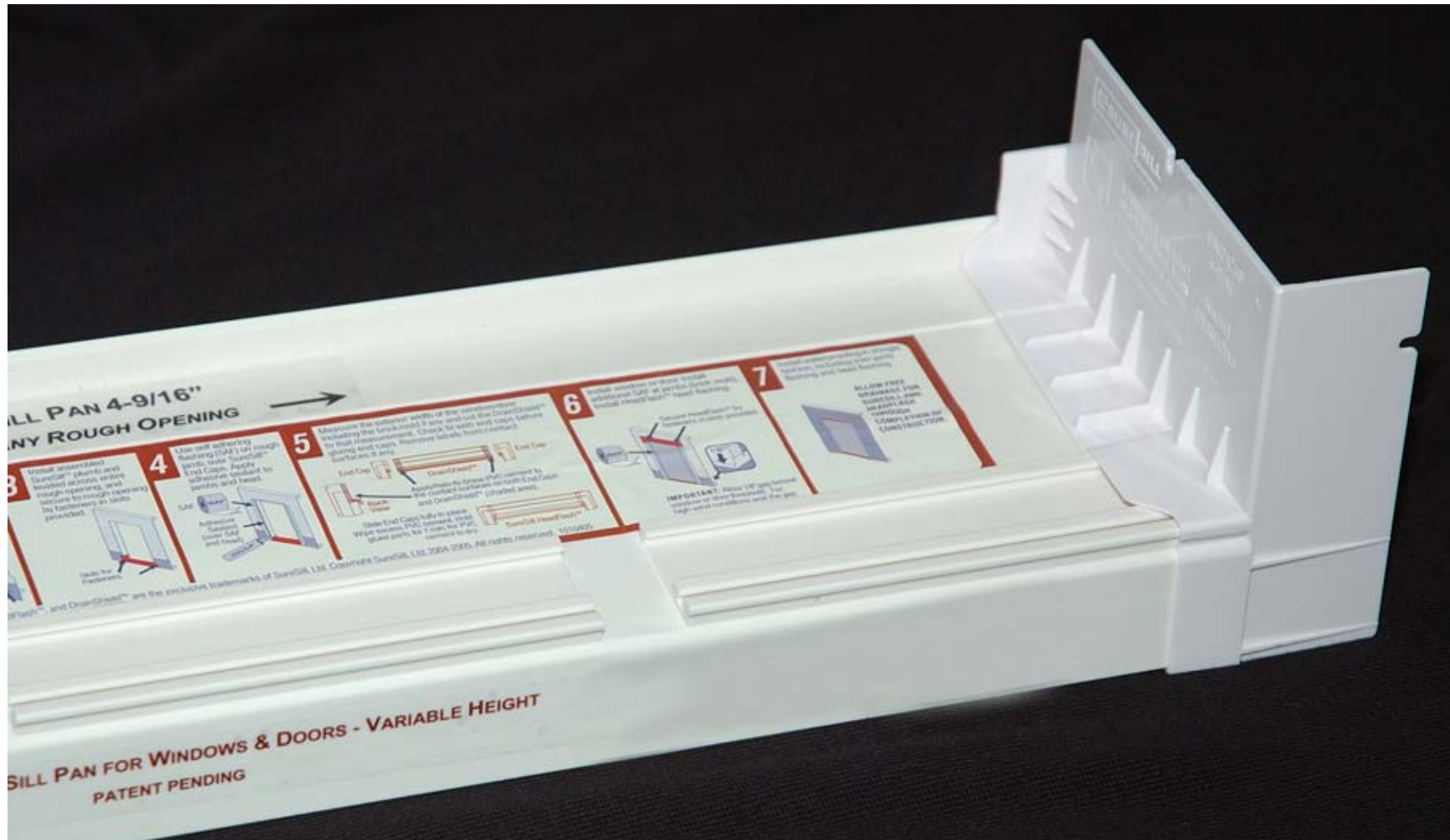


“Kickout” flashing...

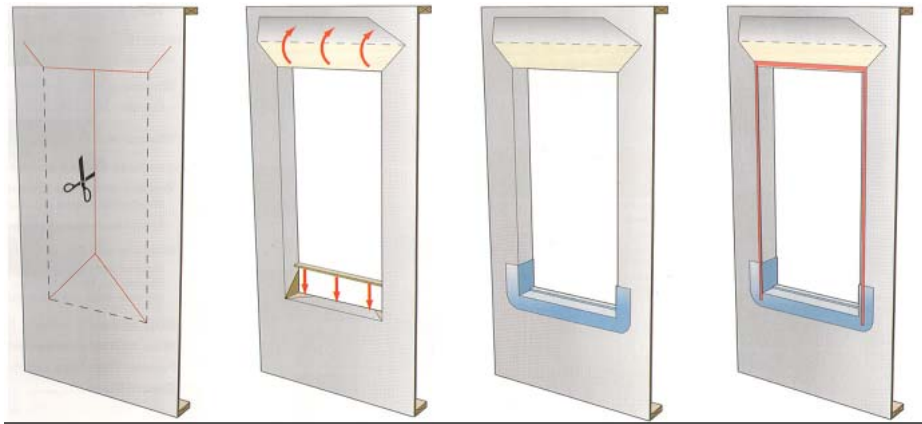
Incredibly important, especially for stucco



Sill pans under windows (because water leaks around windows, eventually)



Most useful... clear **integration** diagrams



Joseph Lstiburek, Ph.D. P.Eng.
Water Management Guide
Building Science Press



Builder establishes the **final** baseline risk

- **Keeping water away**
 - Dry on site storage for lumber and wall board
 - Finish grading and irrigation direction are critical
- **Keeping water out**
 - Foundation - Vapor barrier in contact with slab
 - Measure moisture in framing before 'rocking the walls
 - Supervision, supervision, supervision



Builder - Limiting mold growth

- **Recognize the increased risk of wet materials**
- **Drying services to keep the project on schedule**
- **Consider mold-retarders to gain drying time**



Supervision

Reverse lap **increases** risk



Alert supervisor **reduces** risk



Moisture content & mold growth



Less than 12% WME **reduces** risk

Over 14% WME **increases** risk

Over 19% WME **greatly** increases risk



Drying services to stay on schedule with less risk



Harriman, Schnell & Fowler
"Keeping construction dry"
ASHRAE Journal, Sept 2002



Owner controls ongoing risk

- **Keeping water away**
 - Preferring houses with roof overhangs
 - Preferring xeriscape
 - Preferring simple roofs
- **Keeping water out**
 - Highly permeable paint for exterior stucco
 - Use the shower and kitchen exhaust fans
- **Limiting mold growth**
 - Dry moist materials immediately
 - Understand that condensation = mold risk
 - When in doubt, measure moisture content of materials



Summary

- Reducing risk is economically and culturally more practical than eliminating risk
- All decision makers control risk, but...
- Earliest decisions establish baseline risk
- Builder's Guide available at no cost at:
 - www.gastechnology.org/moldresearch

Thanks to the ratepayers of California, and to the California Energy Commission for making the Guide available at no cost

